

Appl. No. : 10/623,482
Filed : July 18, 2003

REMARKS

In the Office Action mailed on June 16, 2005, the Examiner rejected all pending claims, Claims 1-22, 38-57 and 105-106. In the present Amendment and Response to Office Action, Applicants have amended independent Claim 38. Applicants respectfully request entry of the amendment and full consideration of the remarks contained herein.

Amendments to the Claims

Applicants have amended the claims to further clarify the subject matter that Applicants regard as the invention. Claim 38 has been amended to recite that "trisilane is the silicon source used to deposit a first silicon layer on the substrate." Support for this language can be found throughout the Application as originally filed. *See, e.g.*, the Application, pp. 19-21 and 28, as originally filed. Thus, Applicants respectfully submit that the amendment to the claims adds no new matter and is fully supported by the application as originally filed.

Rejections Under 35 U.S.C. § 102

The Examiner has rejected Claims 38-39, 41, 43-49, 54-56 and 105 as being anticipated by Luo *et al.* (U.S. Patent Publication No. 2003/0059535).

Applicants respectfully submit that the pending claims, as amended herewith, are patentably distinct.

Initially, Applicants note that Claim 38 has been amended to recite that "*trisilane* is the silicon source used to deposit a first silicon layer on the substrate." (emphasis added). In contrast, as noted by the Examiner in his rejections for obviousness, Luo *et al.* does not disclose trisilane as a silicon source. Consequently, Applicants respectfully submit that Luo *et al.* does not anticipate independent Claim 38, nor Claims 39, 41, 43-49, 54-56 and 105 depending from independent Claim 38.

Rejections Under 35 U.S.C. § 103(a)

The Examiner has rejected Claims 1-22, 40, 42, 50-53, 57 and 106 under 35 U.S.C. § 103(a) as being unpatentable over Luo *et al.* in view of Cote *et al.* (U.S. Patent No. 6,252,295), Admitted Prior Art, or Niimi *et al.* (U.S. Patent No. 6,503,846). Luo *et al.* is asserted for

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teaching the general features of the independent Claims 1 and 38. The Examiner notes, however, that Luo *et al.* teaches silane and disilane as silicon sources, but does not teach trisilane as the silicon source. Cote *et al.* is asserted to satisfy this deficiency.

Applicants respectfully traverse the rejections and submit that the pending claims are patentably distinct.

Applicants respectfully submit that the art of record does not establish a *prima facie* case of obviousness. Applicants note that the Examiner bears the burden of providing evidence to support a conclusion of obviousness:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.

M.P.E.P. § 2142. Moreover, to satisfy this requirement, the asserted suggestion or motivation must disclose “the desirability of making the *specific* combination that was made by the applicant.” *In re Sang-Su Lee*, 277 F.3d 1338, 1343 (Fed. Cir. 2002) (emphasis added, citing *In re Dance*, 160 F.3d 1339, 1343 (Fed. Cir. 1998)). “The need for *specificity* pervades this authority.” *Id.* (emphasis added, citing *In re Kotzab*, 217 F.3d 1365, 1371 (Fed. Cir. 2000)). As a result, the suggestion or motivation to combine references must be shown by “*clear and particular*” evidence, “broad conclusory statements regarding the teaching of multiple references, standing alone, are not ‘evidence’” sufficient to support an obviousness rejection. *See In re Dembiczak*, 175 F.3d 994, 50 U.S.P.Q.2d 1614 (Fed. Cir. 1999) (emphasis added).

As a suggestion to combine, the Examiner states that Cote *et al.* teaches that “silane, disilane, also disclosed in Luo, and trisilane are art-recognized equivalents” and, so, “one of ordinary skill in the art would have found it obvious to substitute trisilane for silane.” Thus, Cote *et al.* indicates that trisilane exists as silicon source.

However, the Examiner does not show *why* the skilled artisan would “substitute trisilane for silane.” *Id.* Luo *et al.* only discloses the use of silane and disilane, not trisilane. Cote *et al.* merely places trisilane in a list which includes “silane, disilane, trisilane, tetrasilane, dichlorosilane, and trichlorosilane.” *See Cote et al.*, Col. 2, lines 53-55. The Examiner, however, has failed to allege a specific suggestion for modifying Luo *et al.* to replace silane or

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disilane with trisilane. Neither Luo *et al.*, Cote *et al.* nor the other art of record provides a suggestion to replace silane or disilane specifically with trisilane. Therefore, the suggestion alleged by the Examiner fails to support a *prima facie* case of obviousness because it is only directed to what one skilled in the art *could* do, not to what one *would* do: "Fact that the claimed invention is within the capabilities of one of ordinary skill in the art is not sufficient by itself to establish *prima facie* obviousness." M.P.E.P. § 2143.01. Thus, Applicants respectfully submit that independent Claims 1 and 38 are not rendered obvious by the art of record. As a result, Applicants submit that Claims 2-22, 40, 42, 50-53, 57 and 106, depending from Claims 1 or 38 are also not rendered obvious by the art of record.

Applicants submit that it is only the present Application which teaches the advantages of specifically using trisilane in the claimed cyclic process. Applicants have discovered a process which advantageously uses trisilane to form layers which have superior electrical properties. As discussed in the Application, trisilane can be used to form exceptionally uniform silicon layers that can subsequently be fully reacted to form films with excellent stoichiometry. *See, e.g.*, the Application, pp. 17-18, 33-34. In contrast, precursors such as silane have been found to form less uniform silicon layers, which can cause parts of the substrate underlying thinner parts of the silicon layers to be reacted. *See, e.g.*, the Application, pp. 13-14. This reaction with the substrate has been found to lead to, *e.g.*, silicon nitride layers with inferior electrical properties. *See, e.g.*, the Application, p. 34. Applicants submit that the art of record neither recognizes the problems associated with silicon precursors such as silane, nor does it recognize the advantageous results of trisilane applied in a process such as that claimed. Rather, Applicants submit that it is Applicants who have advantageously developed a cyclic process for depositing superior silicon-containing compound layers using trisilane.

Furthermore, Applicants note that it is not a trivial matter to substitute trisilane for more conventional precursors, since it has a different boiling point, vapor pressure, etc. The skilled artisan would not make this substitution along with associated recipe and equipment adjustments, without recognizing particular benefits of trisilane in this context.

Accordingly, Applicants submit that the pending claims are allowable over the art of record. Applicants have not specifically addressed the further rejections of dependent claims as

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being moot in view of the amendments and remarks herein. However, Applicants expressly do not acquiesce in the Examiner's findings not addressed herein. Indeed, Applicants submit that the dependent claims recite further novel and non-obvious features of particular utility.

CONCLUSIONS

In view of the foregoing amendments and remarks, Applicants request entry of the amendments and submit that the application is in condition for allowance and respectfully request the same. If some issue remains which the Examiner feels may be addressed by Examiner's amendment, the Examiner is cordially invited to call the undersigned for authorization.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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